

Converting M49 General Aviator Protective Masks to M48 Apache Aviator Masks

By Mr. Lowry J. Brooks Jr. and Lieutenant Colonel Robert Walk

The design engineers said that it would be impossible to convert an M49 facepiece to an M48 facepiece without destroying the mask. But they were wrong. Today, Pine Bluff Arsenal (PBA) employees are converting facepieces and saving money for the American taxpayer.

The M48 Apache aviator mask program was implemented at PBA to convert stored M43A1 Type I Apache aviator masks into M48 Apache aviator masks. At the same time, a program was implemented to convert stored M43A1 Type II general aviator masks to M49s. The major difference between the two masks was the right eye lens. The M43A1 Type I and M48 masks had a notched right eye lens for use with the AH-64 Apache signature Integrated Helmet and Display Sighting System (IHADSS). Non-Apache aviators don't need this feature, so the lens was rounded in the M43A1 Type II and M49. Both masks were adopted as standard in 1996. The M45 general aviator mask, which would later replace the M49 due to the significant cost savings, was also adopted at about the same time. But the elimination of the M49 mask program left a large quantity of M43A1 Type II masks with no foreseeable use by the Army. In 2001, the production of M48 masks was ready to begin. Unfortunately, the requirement exceeded the number of



Notched right eye lens on the Apache aviator mask

available M43A1 Type I and M48 masks. The original production line for the M48 had closed in 1994, so restarting the line to make a few masks was cost-prohibitive. Apache aviator masks are more expensive and more labor-intensive to manufacture than other Army protective masks. The only available answer

was to convert M43A1 Type II masks to Type I masks.

Converting the M43A1 Type II masks was the solution, but there were technological hurdles to overcome. First, the masks were assembled with the eye lenses permanently installed and the lenses could not be removed without destroying the mask. Second, there were no replacement notched eye lenses available for installation. Third, there was no approved procedure to perform this alteration. And lastly, there was little funding available for the project.

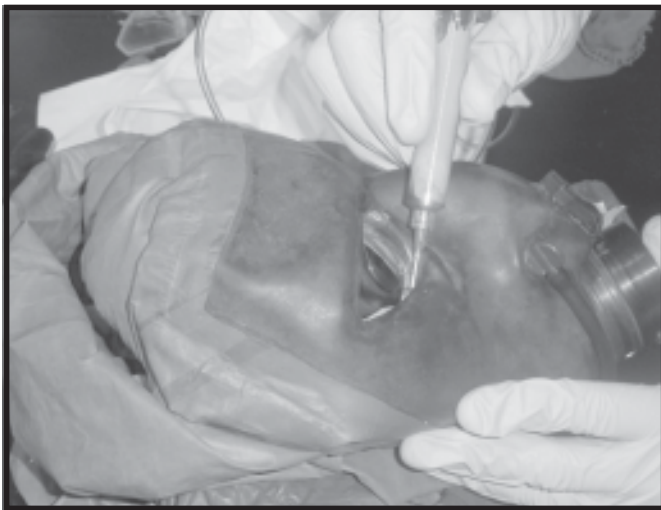
So work began to find a method of converting Type II masks to Type I masks. The M48 team recognized a possible avenue for funding through the Army Operation and Support Cost Reduction Program, but the first proposal was rejected as technologically infeasible. However, through persistence, the M48 team succeeded in obtaining a small grant to conduct engineering research on the removal of the eye lenses.

But the conversion method was meticulous and time-consuming, requiring that the cross-linked polyurethane adhesive holding the lens in place be removed without damaging the rubber facepiece. The remaining adhesive in the eye lens socket was then carefully cleaned out, the eye lens socket was lightly abraded, and an adhesion promoter was applied. The new notched eye lens was then bonded in place inside and outside the mask, and the modified mask was cured and checked for leakage. An additional advantage to this process was the repair of M48 facepieces with scratched eye lenses, a defect that would normally classify the mask as unserviceable.

The M48 team conducted trials to determine the procedure to obtain optimal bonding of the new eye lens



Mask interface with AH-64 Apache IHADSS



A PBA worker uses a pneumatic adhesive dispenser to bond the new eye lens.

to the facepiece and the necessary testing required to prove that the eye lens removal and replacement process worked. PBA sent several unserviceable masks with scratched eye lenses to the US Army Edgewood Chemical Biological Center, and the team replaced the eye lenses in the laboratory. A battery of testing followed, including accelerated storage, rough handling, and leakage. The mask conversion process passed all validation tests and was approved for production in 2002.

Though the notched right eye lens for the M48 mask had not been in production for a decade, a producer was found to supply the necessary replacement part. The M48 team ensured that the new eye lens met the same chemical-agent resistance, physical, and optical performance requirements of the original lens. With the lens replacement problem solved, the M48 team began to focus on who would do the work.



Workers display the first M48 Apache aviator mask from the production line at PBA.

PBA already had a mask conversion production line, and PBA workers volunteered to learn the new conversion process. Initially, four workers were identified as having the necessary skills and patience to complete the job (although only three are currently doing the work). The M48 team worked closely with PBA

to determine the best way to adapt the eye lens removal and insertion methodology from a laboratory to a production environment. The resulting work procedures will be adopted in the depot maintenance work requirements manual for the M48 mask.

Dedicated PBA employees continue to convert M43A1 Type II masks to the M48 standard. With the additional converted M49 masks and the M48 Apache masks already on hand, PBA will have sufficient masks available to meet the needs of the Army for at least the next 10 years. This is a quantum leap in Apache aviator protective-mask availability.

What is the savings? A new production contract for 1,000 M48 masks could be as high as \$10 million. A sunk cost of \$1.8 million has been realized through the production of 1,000 M43A1 Type II masks. Despite the hand labor involved, M43A1 Type II masks are being converted to the M48 standard for about \$400 (\$400,000 for 1,000 masks). This represents a cost savings of \$7.8 million compared with starting a new M48 mask production line.

They said it couldn't be done, but with a little imagination, a small amount of funding, and a positive attitude, it was. The Apache aviator and the American taxpayer are reaping the results of a world-class protective mask.

Reference

Lowry J. Brooks Jr., "Development of an Eye Lens Removal and Insertion Process to Sustain Chemical-Biological Facepiece Assemblies for Apache Aviators," Supply Management Army Operation and Support Cost Reduction Program Proposal, 20 May 2000.

Mr. Brooks is the product manager for the joint service mask leakage tester program. He works for the joint project manager for individual protection at the US Army Edgewood Chemical Biological Center. He previously held the position of product manager for the M48 chemical-biological Apache aviator mask program. He holds a bachelor's degree in physical science from Salisbury State University and a bachelor's degree in mechanical engineering from the University of Maryland, College Park. Mr. Brooks has 11 years of experience in respiratory protection and chemical-biological defense.

Lieutenant Colonel Walk is an Active Reserve chemical officer currently assigned to the Army G8. He is a graduate of the US Army War College, the US Army Command and General Staff College, and the US Army Chemical School. He has held commands at the detachment, company, and battalion levels. Lieutenant Colonel Walk is a qualified hazardous-material technician and a Pennsylvania Essentials trained firefighter.